

## CLAIMS

What is claimed is:

1. An improved boat construction, comprising:
  - a. a hull 100 having a bottom 103, a bow 100a and a stern 100b;
  - b. a plurality of flaps 101, wherein each flap 101 has a forward edge 101a, a rear edge 101b, and a body portion defined therebetween the forward edge 101a and the rear edge 101b, the body portion having an exterior surface 101c and an opposite, interior surface 101d, and is movably mounted to the bottom 103 of the hull 100 at the forward edge 101a such that each flap 101 can be moved between a first position and a second position apart from the first position; and
  - c. for each flap 101, means for moving a corresponding flap 101 between the first position and the second position,wherein when a flap 101 is in the second position, the body portion of the flap 101 is apart from the bottom 103 of the hull 100 at an angle,  $\alpha$ , such that the flap 101 is at least partially extended into the water flow to cause an upward force to be applied towards to the bottom 103 of the hull 100.
2. The boat construction of claim 1, wherein when a flap 101 is in the first position, the angle,  $\alpha$ , has a value substantially around zero such that the exterior surface 101c of the body portion of the flap 101 is substantially flat with the exterior surface 103a of the bottom 103 of the hull 100.
3. The boat construction of claim 1, wherein when a flap 101 is in the first position, the forward edge 101a of the flap 101 is located between the bow 100a and the stern 100b, and the rear edge 101b of the flap 101 is located between the forward edge 101a and the stern 100b.

4. The boat construction of claim 1, wherein the moving means comprises at least one actuating mechanism mounted on the hull 100 and adapted for engaging the flap 101 at the rear edge of the flap 101 and moving the flap 101 between the first position and the second position.
5. The boat construction of claim 4, wherein the actuating mechanism comprises:
  - a. An actuating piston 106;
  - b. An actuating cylinder 107 having an engagement portion 107a and adapted for receiving the actuating piston 106 therein and allowing the actuating piston 106 to move axially between a first position and a second position;
  - c. An actuating cylinder boss 109 mounted on the interior surface 101d of the flap 101;
  - d. A first pin 110 for engaging the actuating cylinder boss 109 and the engagement portion 107a of the actuating cylinder 107; and
  - e. A second pin 108 for engaging the actuating piston 106 through an arm end 105 to a cylinder mounting 118.
6. The boat construction of claim 5, wherein when the actuating piston 106 moves axially between the first position and the second position, the corresponding flap 101 moves accordingly, and the angle  $\alpha$  changes in the range of 0 to 90 degrees.
7. The boat construction of claim 1, further comprising, for each flap 101, means for movably mounting the corresponding flap 101 to the bottom 103 of the hull 100.
8. The boat construction of claim 7, wherein the movably mounting means comprises a hinge 122.

9. The boat construction of claim 1, further comprising:
  - a. An extension portion 102 with a forward edge 102a and a rear edge 102b, and
  - b. An extension guide 112 formed on the interior surface 101d of the body portion of the flap 1012 and adapted for receiving the extension portion 102 therein and allowing the extension portion 102 to be moved along the interior surface 101d.
10. The boat construction of claim 9, further comprising means for moving the extension portion 102 along the interior surface 101d.
11. The boat construction of claim 10, wherein the means for moving the extension portion 102 along the interior surface 101d moves the extension portion 102 along the interior surface 101d telescopically.
12. The boat construction of claim 11, wherein the means for moving the extension portion 102 along the interior surface 101d comprises:
  - a. An extension piston 113 engaging with the extension portion 102 and adapted for moving the extension portion 102;
  - b. An extension cylinder 115 adapted for receiving the extension piston 113 therein and allowing the extension piston 113 to move axially between a first position and a second position so that the extension portion 102 is moved by the extension piston 113 along the interior surface 101d accordingly; and
  - c. An extension cylinder mounting portion 117 mounted to the interior surface 103b of the bottom 103 of the hull 100 and adapted for supporting extension cylinder 115.

13. The boat construction of claim 1, wherein for each flap 101, the body portion defines a plurality of openings 104 along the forward edge 101a.
14. The boat construction of claim 1, further comprising means for individually controlling each of the plurality of flaps 101.
15. The boat construction of claim 1, further comprising, for each flap 101, a housing 120 adapted for receiving a corresponding flap therein.
16. An apparatus for improving performance of a vessel, wherein the vessel has a hull 100 having a bottom 103, a bow 100a and a stern 100b, comprising:
  - a. at least one flap 101, wherein the flap 101 has a forward edge 101a, a rear edge 101b, and a body portion defined therebetween the forward edge 101a and the rear edge 101b, the body portion having an exterior surface 101c and an opposite, interior surface 101d, and is movably mounted to the bottom 103 of the hull 100 at the forward edge 101a such that each flap 101 can be moved between a first position and a second position apart from the first position; and
  - b. means for moving the flap 101 between the first position and the second position,wherein when the flap 101 is in the second position, the body portion of the flap 101 is apart from the bottom 103 of the hull 100 at an angle,  $\alpha$ .
17. The apparatus of claim 15, wherein when the flap 101 is in the first position, the acute angle,  $\alpha$ , has a value substantially around zero such that the exterior surface 101c of the body portion of the flap 101 is substantially flat with the exterior surface 103a of the bottom 103 of the hull 100.

18. The apparatus of claim 15, wherein the moving means comprises at least one actuating mechanism mounted on the hull 100 and adapted for engaging the flap 101 at the rear edge of the flap 101 and moving the flap 101 between the first position and the second position.
19. The apparatus of claim 15, further comprising means for movably mounting the flap 101 to the bottom 103 of the hull 100.
20. The apparatus of claim 15, further comprising an extension portion 102 with a forward edge 102a and a rear edge 102b, wherein the extension portion 102 is movable along the interior surface 101d.
21. A method for improving performance of a vessel, wherein the vessel has a hull 100 having a bottom 103, a bow 100a and a stern 100b, comprising the steps of:
  - a. providing at least one flap 101, wherein the flap 101 has a forward edge 101a, a rear edge 101b, and a body portion defined therebetween the forward edge 101a and the rear edge 101b, the body portion having an exterior surface 101c and an opposite, interior surface 101d, and is movably mounted to the bottom 103 of the hull 100 at the forward edge 101a such that each flap 101 can be moved between a first position and a second position apart from the first position; and
  - a. moving the flap 101 between the first position and the second position, such that the flap 101 is at least partially extended into the water flow to cause an upward force to be applied towards to the bottom 103 of the hull 100 to affect the performance of the vessel, wherein when the flap 101 is in the first position, the acute angle,  $\alpha$ , has a value substantially around zero such that the exterior surface 101c of the body portion of the flap 101 is substantially flat with the exterior

surface 103a of the bottom 103 of the hull 100, and when the flap 101 is in the second position, the body portion of the flap 101 is apart from the bottom 103 of the hull 100 at an angle,  $\alpha$ .